Air Quality Monitoring in Sherwood Park
Summer, 1996 (June 27, July 26 and August 22)

Alberta Environmental Protection is currently conducting an air quality monitoring program in Strathcona County. The objectives of this program are to: (1) determine air quality parameter concentrations in the community of Sherwood Park relative to air quality guidelines and to other small urban locations in the province; and (2) determine the concentrations of specific chemical species in the Strathcona industrial area and at upwind and downwind locations from the industrial area. The program began in the summer of 1996 and is expected to be completed by mid-summer of 1997.

Air quality was measured using a mobile monitoring unit at five locations in northwest (Sioux Road), southwest (Victoria Way), central (Festival Place), northcentral (RCMP Headquarters) and east (Heritage Hills) Sherwood Park. Air quality parameters monitored at these locations included carbon monoxide (CO), ozone (O_3), total hydrocarbons (THC), reactive hydrocarbons (RHC), methane (CH_4), total oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), nitric oxide (NO), hydrogen sulphide (H_2S) and sulphur dioxide (SO_2).

The following is a summary of the results of the mobile air quality monitoring activities in Sherwood Park during the summer of 1996 (June 27, July 26 and August 22). Additional chemicals monitored using integrated techniques (volatile organic compounds and polycyclic aromatic hydrocarbons collected as a 24-hour sample) will be reported after the monitoring program is complete.

Major Findings

- Concentrations of all air quality parameters monitored in Sherwood Park were below the air quality guidelines. Maximum 1-hour average concentrations were:
  - 15% of the 1-hour guideline for CO;
  - 54% of the 1-hour guideline for O_3;
  - 8% of the 1-hour guideline for NO_2;
  - 10% of the 1-hour guideline for H_2S; and
  - 4% of the 1-hour guideline for SO_2.
- Concentrations of pollutants emitted by vehicles (CO, NO_2, NO and THC) were highest at the northwest and southwest sites. Higher levels at these locations are likely due to the influence of vehicle exhaust from major traffic arteries (e.g. Baseline Road and Wye Road).
- Concentrations of sulphur compounds (H_2S and SO_2) were very low in Sherwood Park on all survey days.

Carbon Monoxide (CO)

Max. 1-hour Average	1-hour Guideline
1.9 ppm	13 ppm

Carbon monoxide is a colourless, odourless gas emitted into the atmosphere primarily by motor vehicles. Minor sources include fireplaces, industry, aircraft and natural gas combustion.

The maximum hourly average CO concentration was 1.9 ppm, observed in the morning of August 22 at the southwest monitoring site. This value is about 15% of the 1-hour guideline for CO. Overall average concentrations were generally highest at the northwest and southwest sites and lowest at the east monitoring site. Overall average CO values measured in Sherwood Park were higher than those recorded at the Edmonton east, Fort McMurray and Fort Saskatchewan stations for the same time period. Higher CO concentrations measured in Sherwood Park are likely due to the influence of local traffic passing near the monitoring unit.

Ozone (O_3)

Max. 1-hour Average	1-hour Guideline
0.044 ppm	0.082 ppm

Ozone in the lower atmosphere is produced by: (1) the reaction of oxides of nitrogen and volatile organic compounds in the presence of sunlight; and (2) transport of O_3 from the upper atmosphere to ground level. O_3 concentrations are generally lower in urban centres due to the destruction of O_3 by nitric oxide from vehicle exhaust emissions.

O_3 concentrations in Sherwood Park followed the normal daily trend with lower values in the morning and higher values from mid afternoon to early evening. The maximum 1-hour O_3 concentration was 0.044 ppm, which is 54% of the 1-hour guideline of for O_3. This value was recorded in the early evening of July 26 at the northwest monitoring site. Overall average O_3 concentrations were

similar to those observed in east Edmonton, Fort Saskatchewan and Royal Park (10 km northwest of Vegreville). Average O_3 concentrations ranged from 0.030 ppm at the central site to 0.034 ppm at the northwest site for the three survey days.

Hydrocarbons (THC, RHC and CH_4)

Max. 1-hour Average	1-hour Guideline
THC = 3.0 ppm	no guideline
RHC = 0.8 ppm	no guideline
CH_4 = 2.3 ppm	no guideline

The term "total hydrocarbons" (THC) refers to a broad family of chemicals that contain carbon and hydrogen atoms. Methane (CH_4), a non-reactive hydrocarbon, is the most common hydrocarbon in the earth's atmosphere. Reactive hydrocarbons (RHC) such as alkenes, alkynes and aromatics are important because they can: (1) react with oxides of nitrogen in the presence of sunlight to form ozone; and (2) be toxic to humans, animals or vegetation. Sources of hydrocarbons include vegetation, vehicular emissions, gasoline marketing and storage tanks, petroleum and chemical industries, dry cleaning, fireplaces, natural gas combustion and aircraft traffic.

THC reached a maximum hourly average concentration of 3.0 ppm at the northwest site just before noon on June 27. The maximum RHC concentration was also recorded at this time (0.8 ppm). On average, CH_4 made up about 87% of total hydrocarbons. Overall average THC values were generally higher in Sherwood Park than at other monitoring sites in the province. This is primarily due to exhaust emissions from local traffic in the immediate vicinity of the monitoring unit. Normal background THC concentrations are between 1.5 and 2.0 ppm.

Oxides of Nitrogen (NO_2, NO, NO_x)

Max. 1-hour Average	1-hour Guideline
NO_2 = 0.017 ppm	0.210 ppm
NO = 0.043 ppm	no guideline
NO_x = 0.053 ppm	no guideline

Oxides of nitrogen (NO_x) are the sum of nitrogen dioxide (NO_2) and nitric oxide (NO). During high temperature combustion, as in the burning of natural gas, coal, oil and gasoline, atmospheric nitrogen may combine with molecular oxygen to form NO. NO is colourless, odourless and has no known toxic effects. Most NO is rapidly oxidized to form NO_2. NO_2 is a reddish-brown gas with a pungent odour.

A maximum 1-hour average NO_2 concentration of 0.017 ppm was measured in the late morning at the northwest site on August 22. This value is about 8% of the 1-hour guideline for NO_2. The average NO_2 concentration was similar to values recorded in Fort Saskatchewan and Fort McMurray for the same time period. Again, because of local traffic near the monitoring location, the overall average NO concentration in Sherwood Park was close to that recorded in downtown Edmonton for the same time period. NO_2 values were generally much lower than those recorded in downtown Edmonton.

Hydrogen Sulphide (H_2S)

Max. 1-hour Average	1-hour Guideline
H_2S = 0.001 ppm	0.010 ppm

Hydrogen sulphide (H_2S) is a colourless gas with a rotten egg odour. Industrial sources of H_2S include fugitive emissions (leakages) from petroleum refineries, tank farms for unrefined petroleum products, natural gas plants, petrochemical plants, oil sands plants, sewage treatment facilities, pulp and paper plants which use the kraft pulping process, and animal feedlots. Natural sources of H_2S include sulphur hot springs, sloughs, swamps and lakes.

Hourly average H_2S values measured in Sherwood Park were at or below the detection limit of the monitoring instrument on the three survey days. The maximum 1-hour average H_2S concentration of 0.001 ppm was measured in the late morning on August 22 at the northwest site. This maximum value is 10% of the 1-hour guideline. H_2S concentrations were also very low at other Alberta monitoring stations on the three survey days.

Sulphur Dioxide (SO_2)

Max. 1-hour Average	1-hour Guideline
SO_2 = 0.007 ppm	0.170 ppm

Sulphur dioxide (SO_2) is a colourless gas with a pungent odour. In Alberta, the major sources of SO_2 are natural gas processing plants, oil sands facilities, and power plants. Other sources include gas plant flares, oil refineries, pulp and paper mills and fertilizer plants.

The maximum 1-hour average SO_2 concentration measured in Sherwood Park was 0.007 ppm which is 4% of the 1-hour guideline. This value was recorded in the late morning of August 22 at the northwest monitoring site. Winds were relatively light and from the west to west-southwest directions when the maximum SO_2 value was recorded. The average SO_2 value over the three day monitoring period was lower those recorded over the same time period at the Edmonton east, Fort Saskatchewan and Fort McMurray stations.

Average Concentrations at Each Monitoring Site in Sherwood Park (ppm)

June 27, 1996

Monitoring Site	Monitoring Period	CO	O_3	NO_x	NO_2	NO	THC	CH_4	RHC	H_2S	SO_2	Temp.*	Wind dir/spd*	Cloud*
southwest	10:55 to 11:26	0.3	0.030	0.013	0.012	0.001	2.6	2.3	0.2	0.000	0.000	12	SSE/8-10	15%
northwest	11:37 to 12:04	0.7	0.039	0.010	0.009	0.001	3.0	2.1	0.8	0.000	0.000	12	SSE/8-10	10%
northcentral	12:25 to 12:55	0.7	0.042	0.009	0.008	0.002	2.6	2.0	0.5	0.000	0.000	14	SE/8-10	10%
central	13:04 to 13:34	0.8	0.043	0.007	0.006	0.001	2.5	2.0	0.4	0.000	0.000	16	SSE/8-10	10%
east	13:45 to 14:15	0.5	0.042	0.014	0.005	0.009	2.5	2.0	0.4	0.000	0.000	16	SSE/8-14	5%

July 26, 1996

Monitoring Site	Monitoring Period	CO	O_3	NO_x	NO_2	NO	THC	CH_4	RHC	H2S	SO_2	Temp.*	Wind dir/spd*	Cloud*
southwest	09:34 to 10:40	no data										21	calm	15%
northwest	10:53 to 12:15	0.3	0.023	0.000	0.000	0.000	2.1	1.9	0.1	0.000	0.001	20	calm	80%
northcentral	12:37 to 13:47	0.3	0.033	0.015	0.004	0.010	2.1	1.9	0.1	0.000	0.001	21	ENE/0-3	80%
central	13:58 to 14:56	0.5	0.032	0.043	0.007	0.037	2.2	1.9	0.2	0.000	0.005	21	SE/9	70%
east	15:13 to 16:40	0.4	0.039	0.047	0.010	0.039	2.1	1.9	0.1	0.000	0.002	21	N/12	80%**
southwest	16:57 to 18:32	0.3	0.037	0.053	0.012	0.043	2.2	1.9	0.2	0.000	0.001	21	E/0-5	70%
northwest	19:09 to 20:07	0.7	0.044	0.019	0.008	0.010	2.1	1.9	0.1	0.000	0.000	19	E/10	60%
northcentral	20:15 to 21:15	0.5	0.027	0.015	0.009	0.007	2.2	1.9	0.1	0.000	0.000	18	SE/0-3	80%
central	21:26 to 22:25	0.6	0.019	0.015	0.013	0.002	2.3	2.0	0.2	0.000	0.000	17	E/7	75%
east	22:37 to 23:38	0.4	0.021	0.006	0.005	0.001	2.4	2.0	0.3	0.000	0.000	14	E/7	n/a

August 22, 1996

Monitoring Site	Monitoring Period	CO	O_3	NO_x	NO_2	NO	THC	CH_4	RHC	H2S	SO_2	Temp.*	Wind dir/spd*	Cloud*
southwest	09:09 to 10:15	1.9	0.023	0.017	0.009	0.005	2.6	2.0	0.6	0.000	0.001	21	SSW/0-5	0%
northwest	10:40 to 11:54	1.4	0.028	0.029	0.017	0.010	2.4	2.0	0.3	0.001	0.007	21	WSW-W/7-10	0%
northcentral	12:04 to 13:02	0.6	0.033	0.016	0.008	0.004	2.1	1.9	0.2	0.000	0.006	22	WSW/7	0%
central	13:12 to 14:09	0.6	0.035	0.008	0.005	0.001	2.1	1.8	0.1	0.000	0.002	23	WSW/0-7	0%
east	14:20 to 15:33	0.6	0.038	0.005	0.005	0.000	2.0	1.8	0.2	0.000	0.002	n/a	WSW-W/0-5	0%
southwest	15:48 to 16:44	0.7	0.039	0.010	0.005	0.003	2.0	1.8	0.1	0.000	0.000	n/a	SSE-S/5-10	0%
northwest	16:53 to 17:54	0.7	0.036	0.039	0.008	0.027	2.0	1.8	0.1	0.000	0.000	n/a	SW/5-10	0%
northcentral	18:06 to 19:04	0.7	0.028	0.034	0.014	0.017	2.0	1.8	0.2	0.000	0.002	n/a	S-SSW/5	25-50%
central	19:13 to 20:14	0.6	0.020	0.019	0.012	0.005	2.2	1.8	0.3	0.000	0.000	n/a	S/0-5	25-50%
east	20:30 to 21:32	0.2	0.022	0.007	0.007	0.001	2.3	1.9	0.3	0.000	0.000	n/a	S/5	0%

* Weather conditions are based on observations at the monitoring site. Units are temperature [°C], wind speed [km/h] and cloud cover [% of sky coverage].

** rain showers

Average Concentrations at Each Monitoring Site in Sherwood Park (ppm)

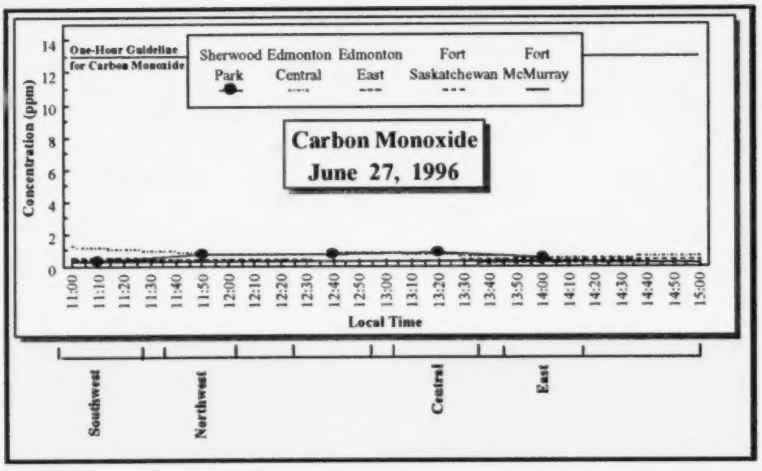
Monitoring Site	CO	O_3	NO_x	NO_2	NO	THC	CH_4	RHC	H_2S	SO_2
southwest	0.8	0.032	0.023	0.010	0.013	2.4	2.0	0.3	0.000	0.001
northwest	0.8	0.034	0.019	0.009	0.010	2.3	1.9	0.3	0.000	0.002
northcentral	0.6	0.033	0.018	0.009	0.008	2.2	1.9	0.2	0.000	0.002
central	0.6	0.030	0.018	0.008	0.009	2.2	1.9	0.2	0.000	0.001
east	0.4	0.032	0.016	0.006	0.010	2.3	1.9	0.2	0.000	0.001

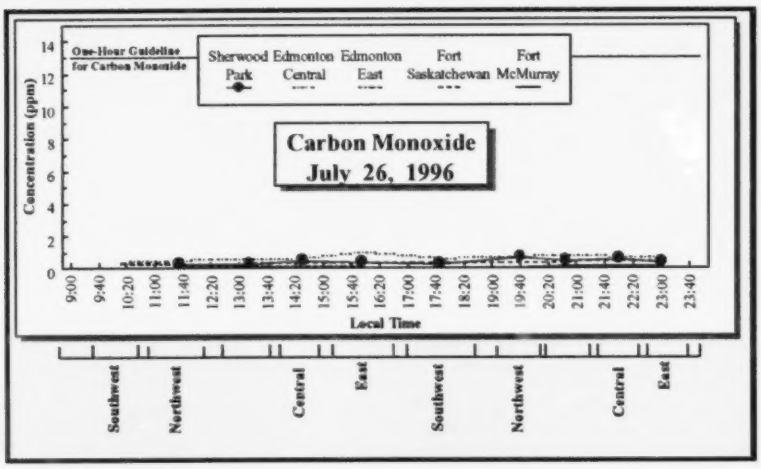
Overall Average Concentrations on All Summer Survey Days (ppm)

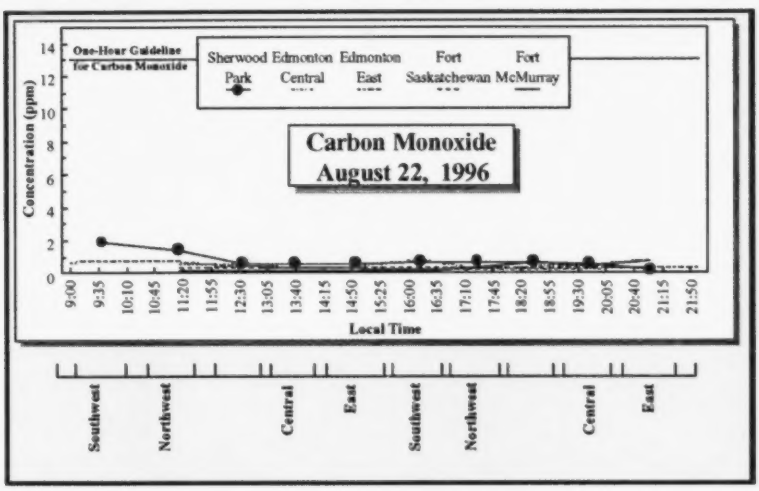
Location	CO	O_3	NO_x	NO_2	NO	THC	CH_4	RHC	H_2S	SO_2
Sherwood Park	0.6	0.033	0.018	0.008	0.009	2.3	2.0	0.3	0.000	0.001
Edmonton Central	0.7	0.019	0.029	0.016	0.011	1.6	no data	no data	no data	no data
Edmonton East	0.3	0.031	0.017	0.011	0.006	1.5	no data	no data	0.000	0.003
Fort Saskatchewan	0.4	0.036	0.011	0.008	0.002	1.3	no data	no data	0.000	0.002
Fort McMurray	0.2	0.023	0.008	0.005	0.004	1.6	no data	no data	0.000	0.002
Royal Park	no data	0.032	0.003	0.003	0.000	no data	no data	no data	no data	no data

Summer, 1996

Average Carbon Monoxide Concentrations in Sherwood Park

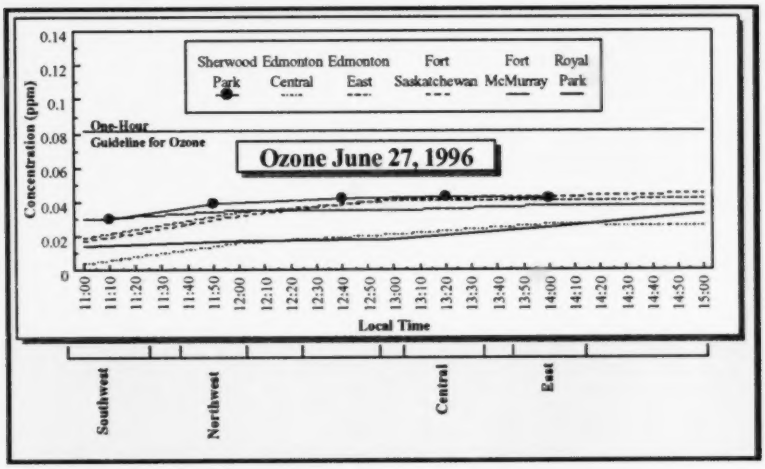


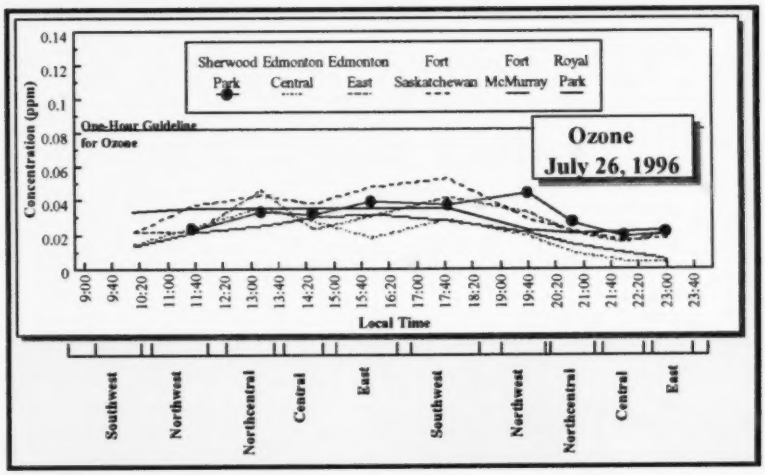


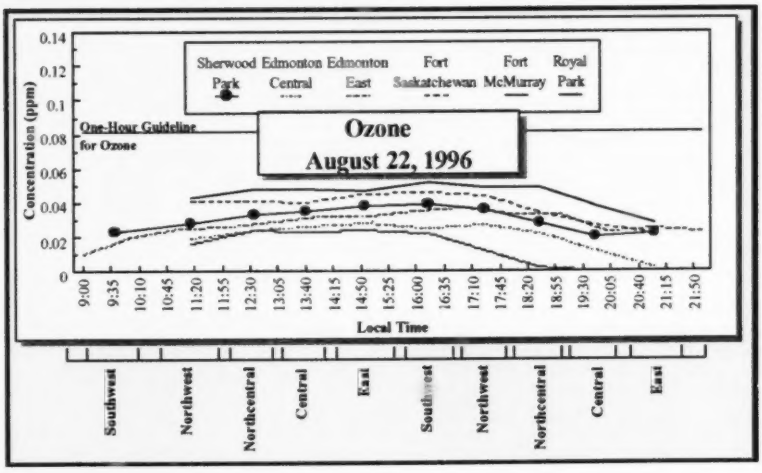


Summer, 1996

Average Ozone Concentrations in Sherwood Park

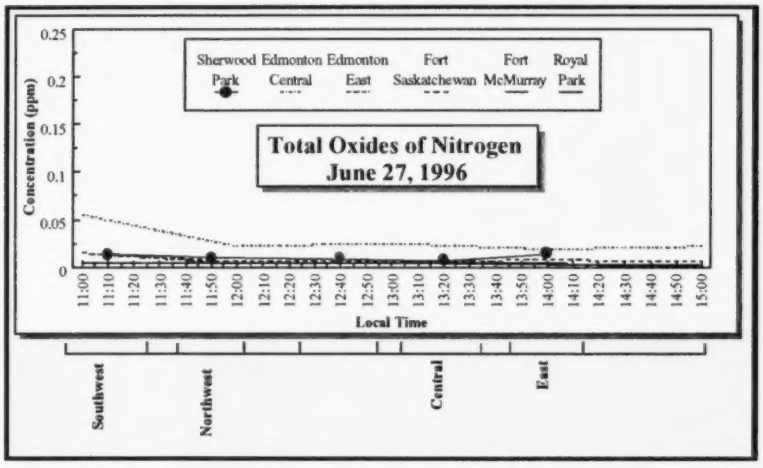


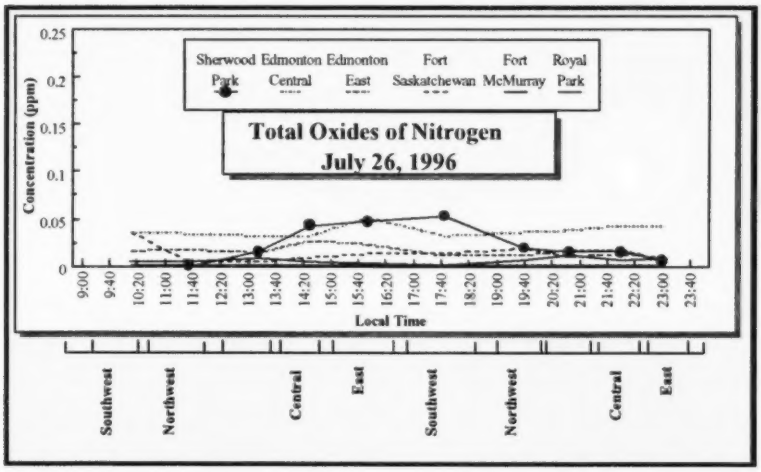


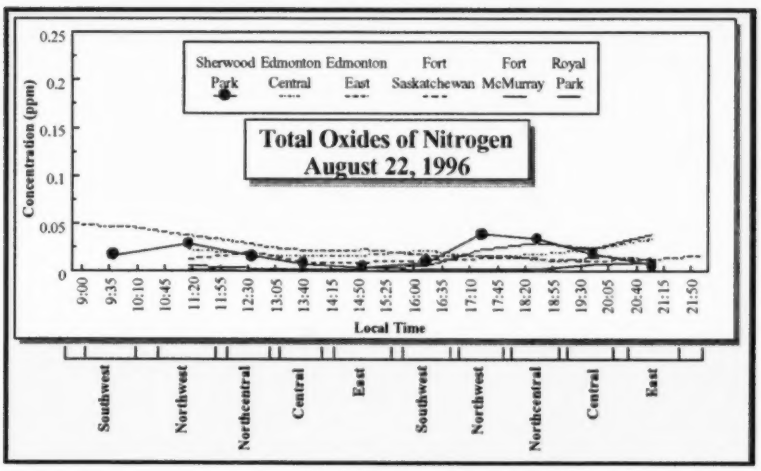


Summer, 1996

Average Total Oxides of Nitrogen Concentrations in Sherwood Park

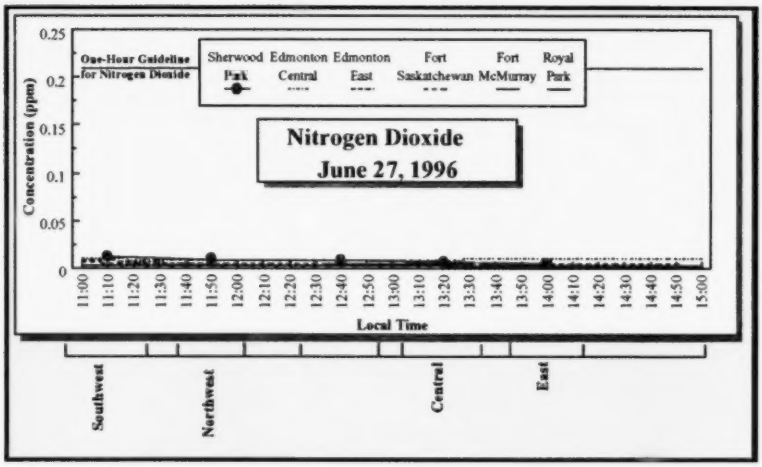


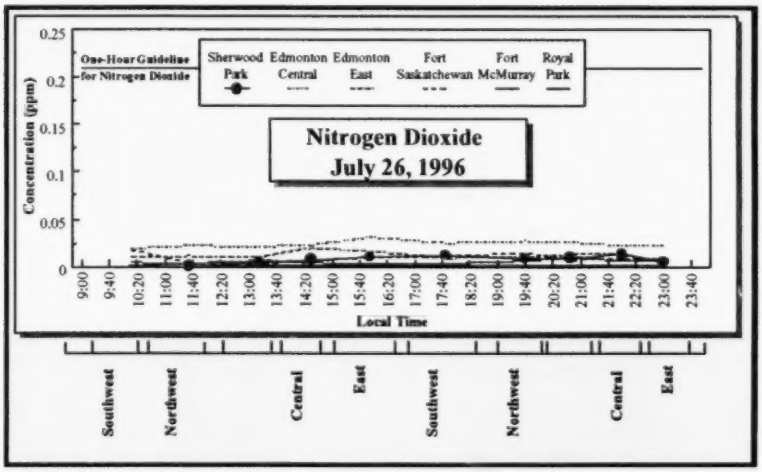


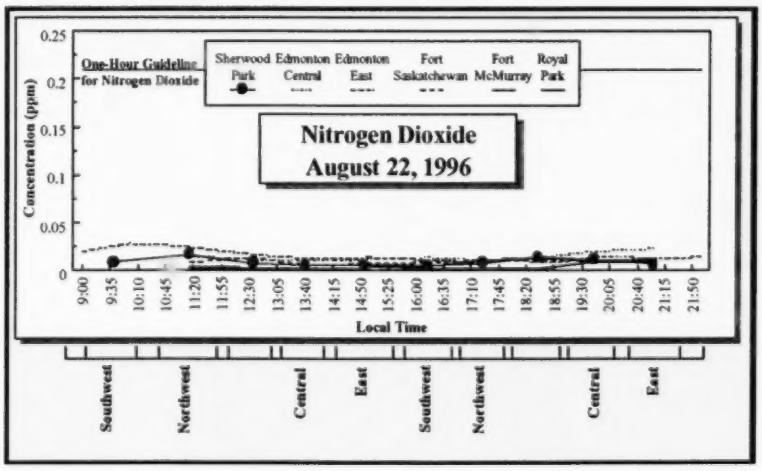


Summer, 1996

Average Nitrogen Dioxide Concentrations in Sherwood Park

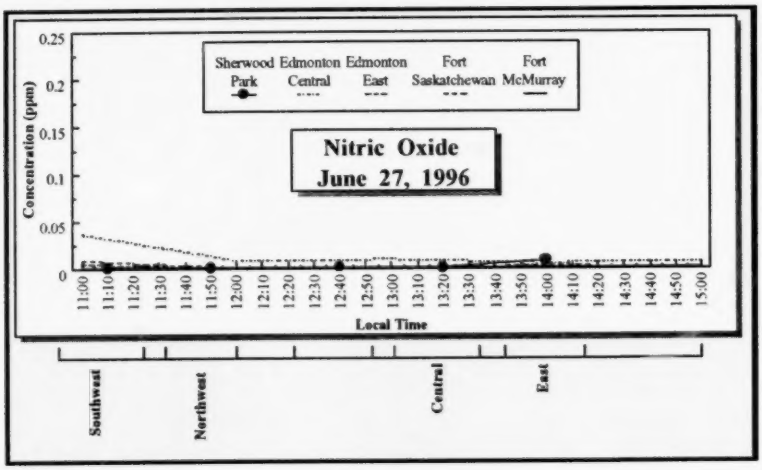


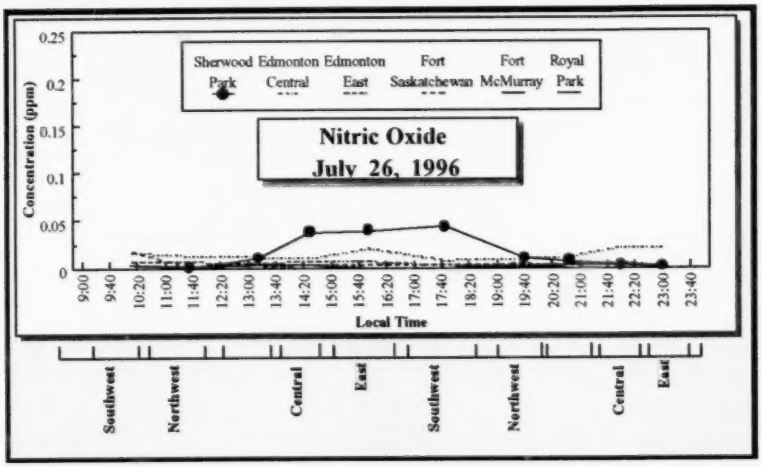


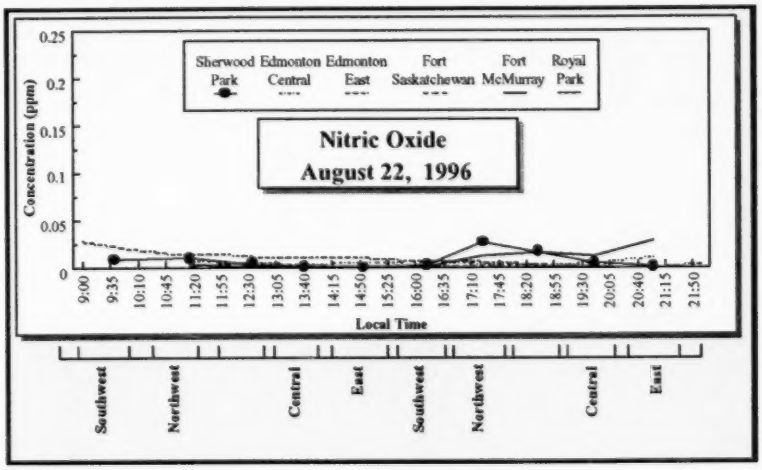


Summer, 1996

Average Nitric Oxide Concentrations in Sherwood Park

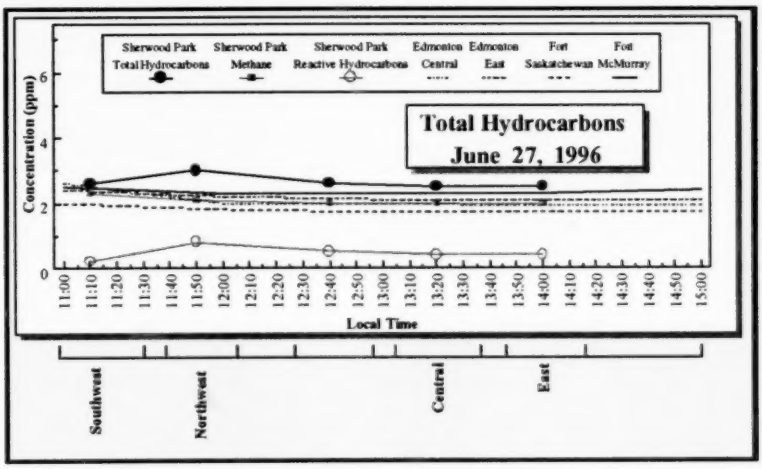


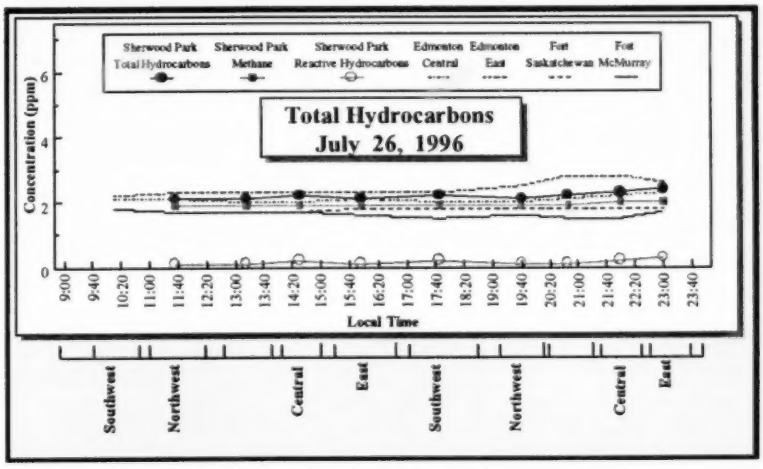


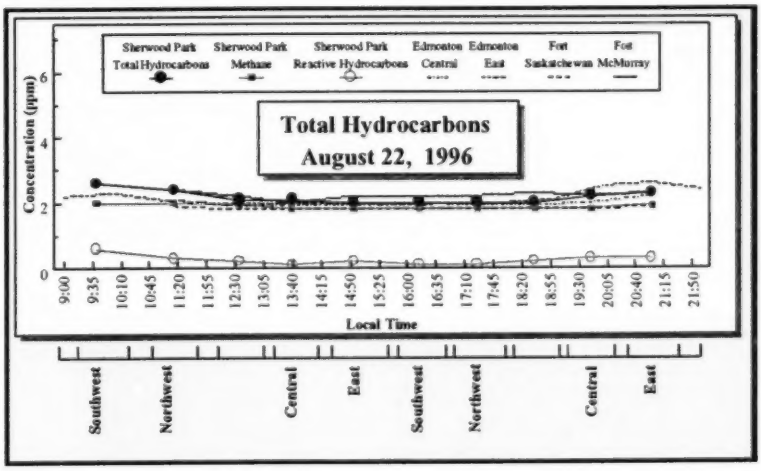


Summer, 1996

Average Total Hydrocarbon Concentrations in Sherwood Park

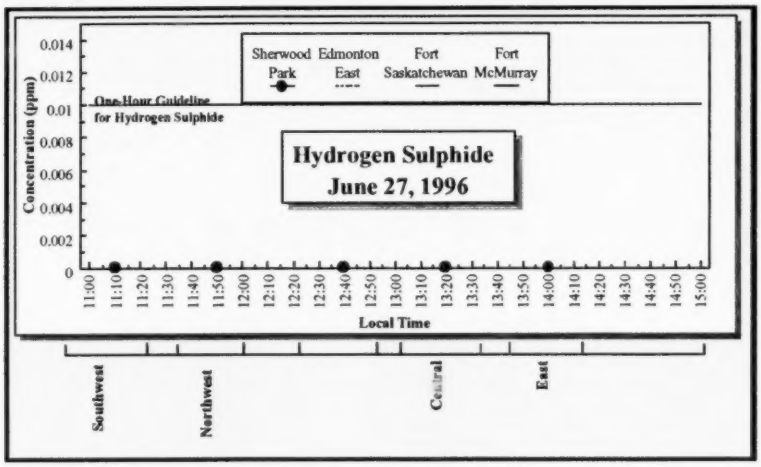


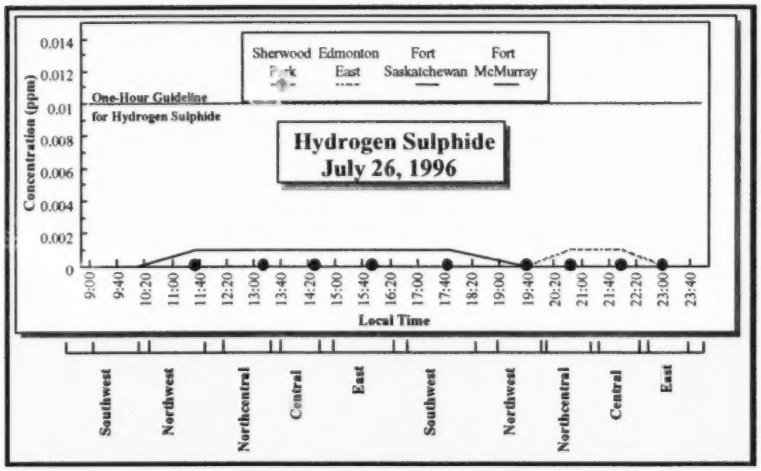


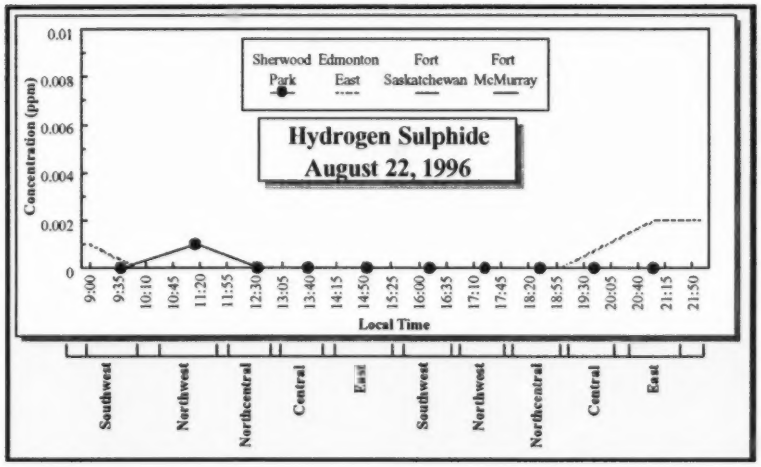


Summer, 1996

Average Hydrogen Sulphide Concentrations in Sherwood Park







Summer, 1996

Average Sulphur Dioxide Concentrations in Sherwood Park